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Patentanmeldung Nr. Patent application No. Demande de brevet n°

98310082.7

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For the President of the European Patent Office

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Page 2 de l'attestation

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Application no.:
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SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.
2596 HR Den Haag
NETHERLANDS

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Transponder communications system

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Title: Transponder Communications System TS 9183 EPC

Technical Field

This invention relates to a transponder system enabling two-way communication between a fixed station and a mobile station such as in a vehicle or carried by a user. The communication is wireless, that is by a mode that requires no tangible communication circuit between the fixed and mobile stations.

Background Art

Proposals have already been made to provide vehicles or their drivers with tags which can be interrogated to identify the vehicle or person concerned in order to facilitate a transaction such as the purchase of petrol or other services at a garage or service station. The tag has embedded within it an identity code which can be interrogated from a fixed point. Tags for this use are made by Micron Communications, Inc. of Boise, Idaho, U.S.A. One implementation is to provide an interrogator in a petrol pump. The tag is presented to the pump and interrogated to provide identification information for billing purposes. Alternatively the tag may be mounted in the car, as on the rear window.

Communication between the tag and the fixed interrogator is by a wireless communication means, for example by a magnetic field, infra-red or radio link. The use of a wireless communication medium and the characterisation of the radiation pattern of the antenna system or other radiating means provides for greater flexibility in the location of the tag relative to that of

the fixed station. In general radio frequency identification systems, referred to as RFID: have advantages as regards range and signal penetration and can be implemented in radio frequency bands assigned by the authorities in numerous countries and being available for very low power transmission without licensing.

For the purposes of this specification reference will be made to communication between a transponder, e.g. the abovementioned tag, and a remote station, e.g. the above-mentioned interrogator.

Patent Specification WO98/25248 of Micron Communications, Inc. describes an RFID system applied to a vehicle in which there is an on-board computer system for monitoring and reporting parameters relating to various engine functions in combination with RFID transponder circuitry linked to the computer by a serial bus. The RFID communicates with a fixed interrogator over a radio link. The RFID circuit has a unique identification code. In response to a signal from the interrogator the RFID circuit responds by identifying itself and parameter data is sent to the interrogator through the RFID transponder.

WO98/25248 also mentions proposals which involve inputting data to the RFID transponder for storage in internal memory for controlling vehicle functions or for other purposes. An example of RFID circuitry suitable for the system on-board the vehicle is disclosed in U.S. patent application Serial 08/705,043.

Specification WO98/05171 (Micron Communications, Inc.) describes an RFID device with adjustable receiver sensitivity. It discloses the implementation of this type of device in a compact form, such as in an identification card, using a thin profile button-type battery. U.S. patent 5 448 110 (Tuttle) assigned to Micron Communications, Inc.) also addresses the problems of fabricating a compact RFID transceiver assembly in a low profile, flat, form. It discloses the possibility of transferring into an internal memory data received from a remote external interrogator and transmitting data stored in the internal memory.

The present invention is concerned with apparatus in a vehicle which enables information/entertainment and messages in general to be provided to the driver or other occupants of the vehicle.

Summary of the Invention

The invention has been developed in connection with two particular circumstances in which communications with the interior of the vehicle is difficult. The first is in a car wash where the car radio aerial is retracted, the car is closed up. It is difficult to reliably supply information/
entertainment at this point. The other circumstance is where the ignition is switched off leaving the car radio etc. inoperative.

According to the present invention there is provided

a unit for providing messages to a user emanating from a remote station, comprising:

a transponder for communicating with the remote station by a wireless mode of communication,

said transponder storing an identification code and being responsive to an interrogation signal from the remote station to emit an identification signal bearing said identification code,

said transponder being responsive to incoming data signals including an address code, which may be the same as or derived from said identification code, to provide the data to data processing means, and

said data processing means including means for providing an audio (which may be aural) and/or visual output for the user of the unit.

The invention and its preferred practice will be further described with reference to embodiments illustrated in the accompanying drawings in which:-

Fig. 1 is a block diagram of a system incorporating a unit in accord with the invention;

Figs. 2A-2C are diagrams of modifications to the processing section of the unit of Fig. 1.

Description of the Embodiments

The embodiment of the invention illustrated in Fig. 1 will be described in the context of a unit intended to be mounted in a vehicle, and more particularly within the saloon of the vehicle, to provide messages of various

kinds to the driver or other occupant of the vehicle. The wireless mode of communication assumed for purposes of illustration is a radio link which may be one using spread spectrum techniques to enhance security and the selective communication of the fixed or remote station with a desired vehicle unit. Wireless links include, in addition to radio, magnetic induction, sound waves, particularly ultrasonic, and optical, e.g. infra-red. The radio communication between the fixed station and the vehicle unit in the system to be described, uses very low power. In many countries frequency bands are assigned for low power, short range, communication without the necessity of licensing.

The circuit to be described is constructed as a self-contained unit 1. The unit is located within a housing or case adapted to be mounted or attached at a suitable location within the vehicle. The unit 1 can be broadly considered in two parts, a transponder section 10 for communicating with a remote station 2 and a signal processing section 30 for providing an audio output to the vehicle occupant. The remote station 2 radiates radio signals through antenna 3 and may be linked as at 4 to a central network. The unit is intended to provide audio and/or visual information/entertainment or messages in general to the driver or other vehicle occupants. The description that follows will initially concentrate on an audio output. The transponder section 10 communicates

with the remote station 2 by a radio link.

The transponder section 10 includes a receiver/transmitter unit 12 providing a transceive facility for receiving/sending radio signals through an antenna 14 contained within the housing. A microprocessor 16 has associated with it a memory 18 storing an identification code, specific to the transponder, permanently resident in a section of memory 19. The transfer of data between the units 1 and 2 may be accomplished using a packet mode of transmission.

The microprocessor implements the program routines controlling the transponder 10. These routines may be stored in memory 18 or elsewhere. The memory used may be on-chip or separate from the microprocessor.

The transponder 10 also has a data port 20, e.g. a serial port, through which data is sent to the processing section 30. As will be described later the data communication through port 20 may be made bidirectional to add interactive facilities for the user. The unit 1 is self-powered so that it includes at least one battery for powering (V_s) the transponder and processing sections. The battery requirements are discussed further below. As illustrated the transponder section 10 has its own battery 22.

In operation, when it is in range the transponder section responds to an interrogation signal from remote station 2 that is sent continuously or at regular

intervals. The interrogation signal is recognized by the microprocessor 16 and it responds by causing the identification code in memory 19 to be sent to the remote station 2 where it is stored to enable subsequent selective addressing of the transponder section 10. The address code may be the identification code or a code derived from it, i.e. part of the ID code, or it may be a code established at the time by the remote station 2 and stored in memory 18 for enabling transactions to be selectively established with unit 1. By this means data signals can be specifically directed to a given vehicle, even if other vehicles are within range. The nature and purpose of the data is discussed further below. The data addressed to unit 1 is extracted and formatted into a data stream by the microprocessor 16 and sent to the processing section 30 through port 20.

The processing section 30 is designed to use the incoming data to provide an audio signal may be used to provide an eventual external aural or audible signal (Fig. 2A) or it may be used directly in the unit to provide a sound output within the vehicle for the driver or other occupants. In processing section 30 the processing is controlled and the data decoded by a microprocessor (microcontroller) 32. The microcontroller receives a stream of serial data through serial port 20. This data is to be decoded to an audio signal. e.g. an announcement or music, which is output to an audio output stage 34

driving a speaker 36 which is contained within the housing of unit 1 with appropriate provision for emitting the sound output. Under some circumstances it may be desired that the delivery of the audio signal is not to be done immediately as the data stream arrives but is to be triggered at a later time. The microcontroller has associated with it an extended memory 38 in which the data stream can be stored until required for decoding. It is contemplated that the incoming data will be in the form of compressed data files, so that memory space (RAM) will be required in any event in connection with the expansion and decoding of the compressed data files. The data stream may also need decryption where data is sent from the remote station in an encrypted form. This process may be implemented to allow playing of portions of the audio or video message while the remainder is still being decoded.

The illustrated processing unit 30 contains its own battery 38 which has to be of sufficient capacity to power the audio output stage 34 to drive a small speaker 36. It will be appreciated that since the transponder section 10 and the processing section 30 are intended to be parts of a single unit, a single battery may be used to power both.

As already mentioned, the transponder and data processing sections are to be contained in a small housing attachable to a suitable surface within the vehicle. Transponders for use in RFID applications are already

available in small flat packages, such transponders are available from Micron Communications, Inc. that are small enough to be used as a tag on a key ring.

To exemplify one use of the unit described thus far, it can be used to provide information or music within a vehicle going through a car wash. A fixed interrogator unit can be mounted adjacent the entry to the car wash to activate and identify the unit 1, and to address a data stream to it. This data stream can be decoded immediately to play the message or music while the vehicle is going through the car wash. Another possibility is to load the data stream elsewhere in a service station so that it is available should the vehicle then enter the car wash facility. The data stream is stored in memory and a trigger signal is provided on entering the car wash to cause the message/music to be played. In this case a remote station may be located at the entry to the car wash to transmit an appropriate trigger signal recognised by the transponder section 10 to initiate playback of the stored message.

It will be realised that the above-described unit is capable of providing the aural output for the vehicle occupant even in circumstances where the ignition is turned off and the vehicle electrics are dead. Even if the electrical power is available within the vehicle, the self-contained nature of the unit means that it functions without reliance on other electrical equipment within the

vehicle together with any special provision that may need to be made to link the unit 1 to other electrically-powered equipment.

However, it is envisaged that for audio messages, advantage could be taken of audio equipment installed in the vehicle. Fig. 2A shows the decoded audio output of the microcontroller being used to modulate a very low power FM transmitter 40, fabricated as an integrated circuit, contained within the unit 1 to radiate 41 a signal capable of being picked up on a car radio in the vehicle.

Figs. 2B to 2C also indicate other modifications. Fig. 2B shows the possibility of using a visual display arrangement 42 within the unit 1, such as one using an LCD display mounted to a wall of the housing to display visual messages externally of the housing. This could be done in addition to or instead of the audio message output described above.

Another development is to provide some interactivity from within the vehicle; for example by selection of options presented to the occupant. People are used to exercising options via key-pad operated devices. Fig. 2C shows a modification in which the microcontroller 32 provides an output to the user via an output device generally indicated as 44 (this may be audio and/or visual) and there is provided an input port or interface 46 within processing section 30 which is connected to the

microcontroller and by means of which a user-operable input device, for example a key pad 48, is linked to provide input signals to the microcontroller 32. If the input device is a key-pad, while it may be incorporated in the unit 1, for convenience of use, it may be preferable to have the keypad 48 external to the unit 1 as shown. The connection to the unit 1 at port 48 may be made by a link 50 such as a cable or by infra-red. However, the interactivity by the user could be provided by voice commands in which case it may be possible to mount a voice responsive component as a part of the unit 1.

In the illustrated case key actuation is recognized by the microcontroller 32 which generates a code corresponding to the actuated key. This code is returned to the transponder microprocessor 16 via the serial port 20. The microprocessor 16 will then initiate a digitally coded signal for return to the remote station 2. The external action taken thereafter need not be restricted to providing information directly for the occupant. Data may be provided to other means within the unit 1 with, if desired, an acknowledgement for the occupant of the action taken. For example, it may be concerned with up-dating the sum available in a credit card memory connected to the microprocessor 16.

Although the practice of the invention has been described in relation to a self-contained unit for use within a vehicle, a wider utility is envisaged. For

example, it could be used to call up commentaries or specific information directed to user in museums, galleries and the like. The user can selectively obtain the wanted information without affecting other users in the vicinity. In such a case any audio output may be better provided to the user by headphones plugged into a socket on the housing of the unit. A headphone socket 40 is shown in Fig. 1. It may be an alternative to the speaker 36 or arranged to cut out the speaker when the headphones are plugged in.

The unit which has been described, together with its various modifications has been discussed in terms of a transponder section providing the facilities to communicate on the one hand with a remote station, and on the other hand communicating internally with the processor section; and a processing section in data communication with the transponder section on the one hand and on the other hand providing the audio and/or visual communication within the user. It will be understood that in order to perform the functions described a practical unit may use a single microprocessor or microcontroller to perform the functions of components 16 and 32 and a single block of addressable memory to perform the functions of memories 18 and 38. To enhance fabrication into a compact, integrated unit, a single battery would be preferable. The batteries used in the practice of the invention may be of a rechargeable kind.

Mention has been made above of sending data by means of compressed files. Specification WO98/23039 (Innomedia Pte Ltd.) describes concatenation compression for real-time voice and data processing. Another example of a compression technique for audio and data signals sent from one site to another is described in U.S. patent 5,742,773 (Blomfield-Brown et al).

TS 9183 EPC

Claims

1. A unit for providing messages to a user emanating from a remote station, comprising:

a transponder for communicating with the remote station by a wireless mode of communication,

said transponder storing an identification code and being responsive to an interrogation signal from the remote station to emit an identification signal bearing said identification code,

said transponder being responsive to incoming data signals including an address code, which may be the same as or derived from said identification code, to provide the data to data processing means, and

said data processing means including means for providing an audio and/or visual output for the user of the unit.

2. A unit as claimed in Claim 1 in which said means for providing an audio and/or visual output at least includes means for providing an aural output.

3. A unit as claimed in Claim 1 in which said means for providing an audio and/or visual output is operable to provide at least an audio output, and further comprising means responsive to the audio output to generate a modulated signal for emitting externally of the unit.

4. A unit as claimed in Claim 1, 2 or 3 including means for receiving an input from a user in response to the audio and/or visual output and to initiate a signal from

said transponder for communicating the user input to a remote station.

5. A unit as claimed in Claim 4 further comprising a keypad or keyboard for generating the user input.

6. A unit as claimed in any preceding claim in which the unit is contained within a housing including one or more batteries for powering said transponder and said data processing means.

7. A unit as claimed in any preceding claim further comprising means for linking to a device external of the unit and operable by the user to generate inputs to the unit.

Title: Transponder Communications System TS 9183 EPC

ABSTRACT

A unit (1) for use in a vehicle is interrogated and identified by a fixed interrogator (2). A wireless form of communication is established between the unit (1) and interrogator (2) to permit transfer of data to the unit (1). As well as appropriate communication circuitry (12) and an identification store (19), the unit (1) includes processing of the incoming data by a microprocessor (32) to provide an audio signal for energising a loud speaker (36) in the unit (1) to provide a sound output for the vehicle occupants. The unit is powered by internal batteries (22, 38) to be usable even when the vehicle ignition is turned off. The unit (1) is made self-contained to be mounted wherever convenient. The principle can be extended to providing data to control a visual display (Fig. 2B) in the unit (1). The unit (1) may be provided with a user-interactive input such as a keypad (48). A radio link is described but other wireless means of communication are feasible.

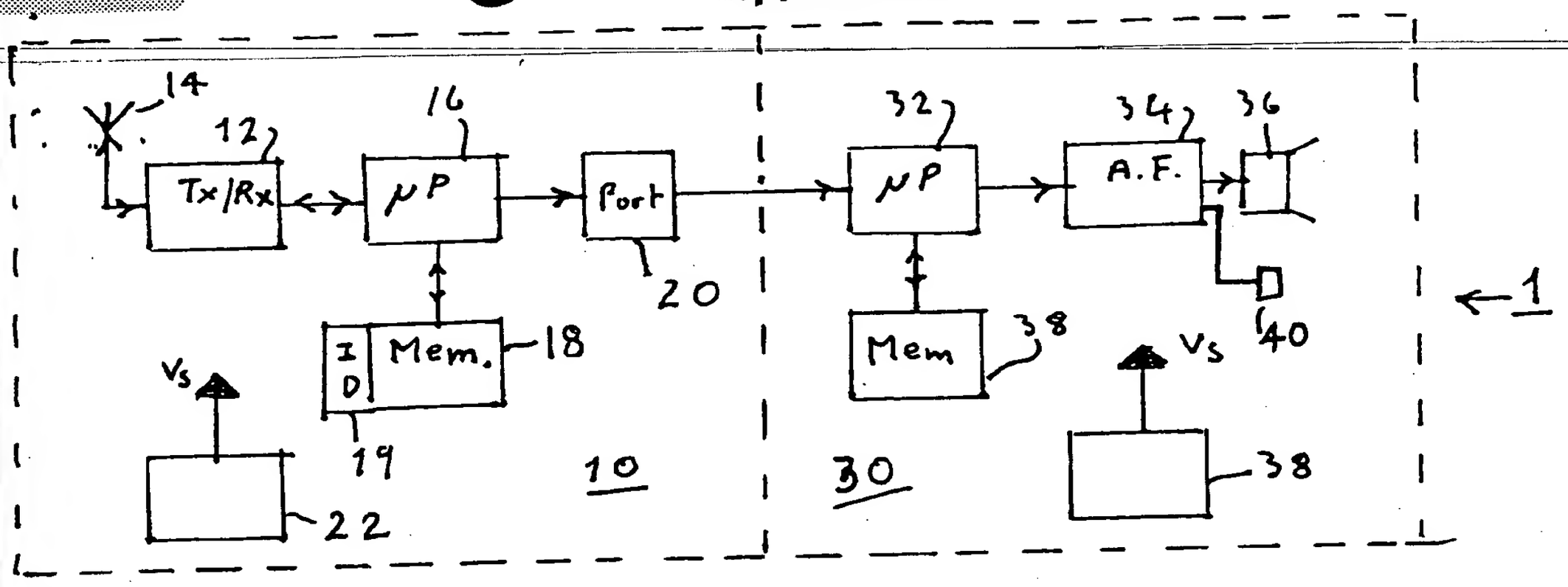


Fig. 1

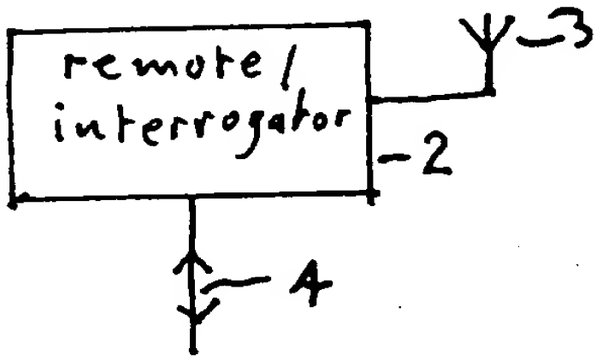


Fig. 2A

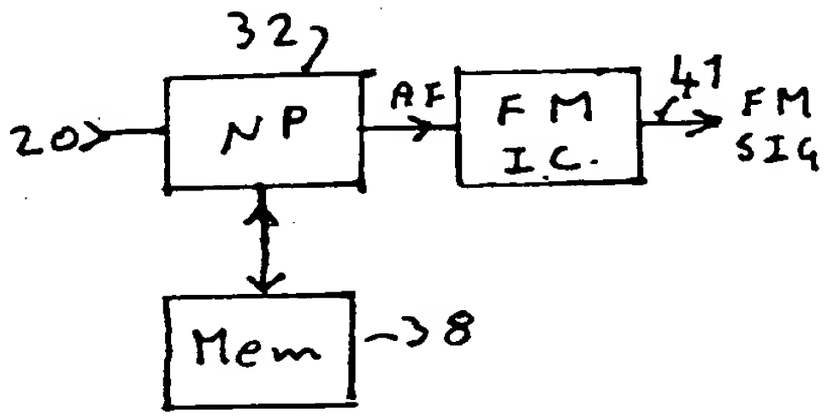
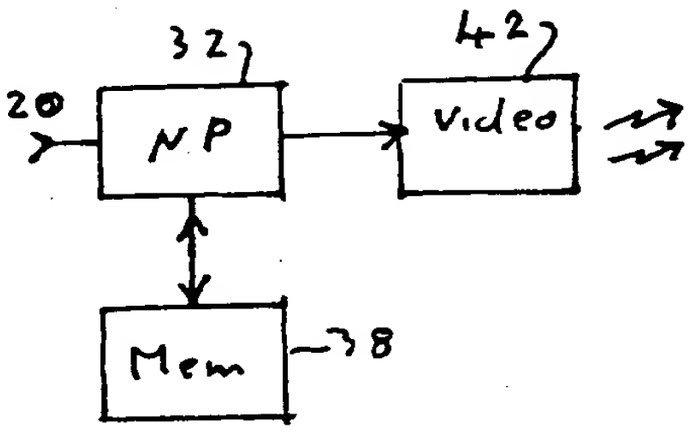


Fig. 2B



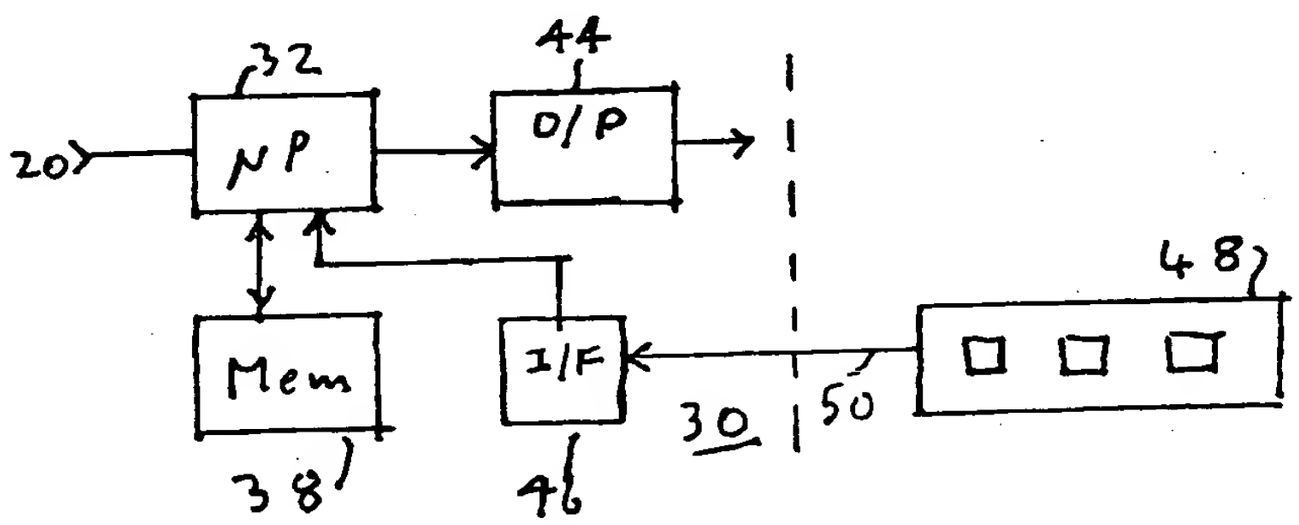


Fig. 2C

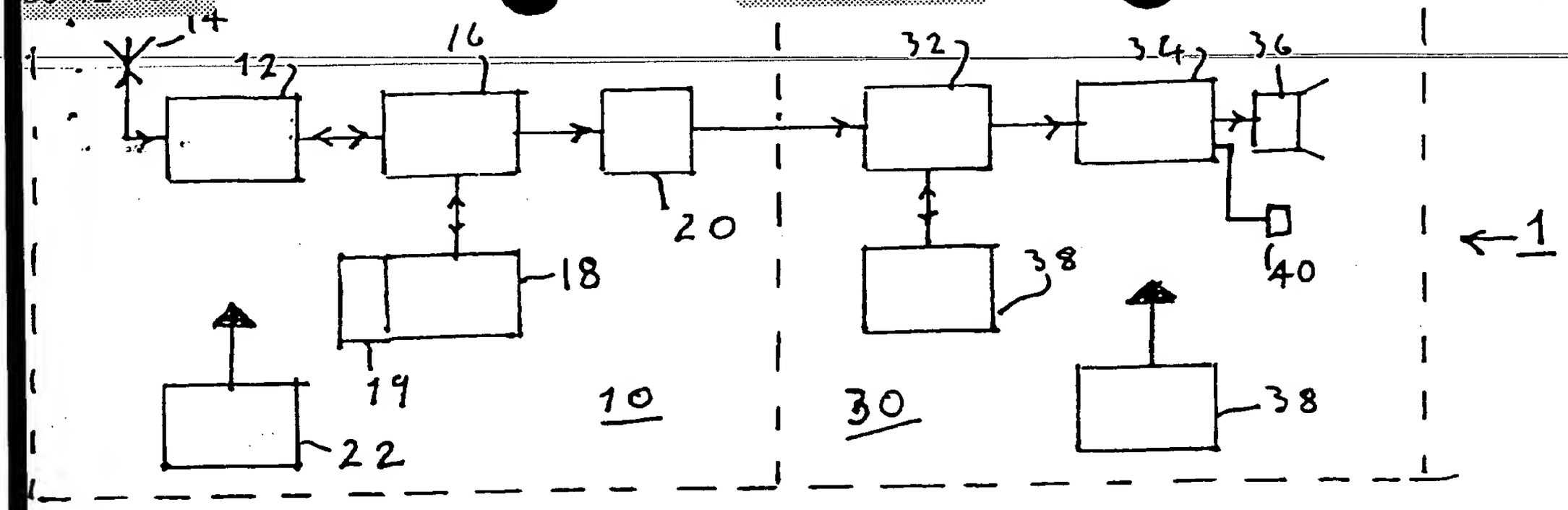


Fig. 1

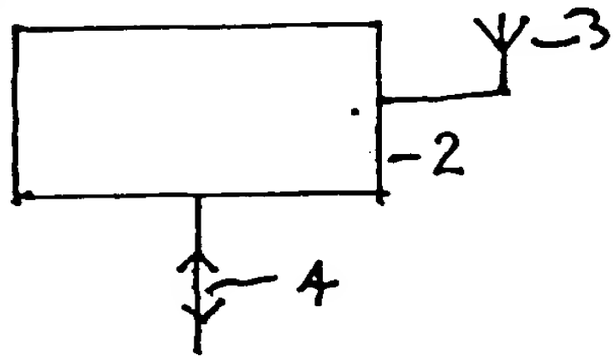


Fig. 2A

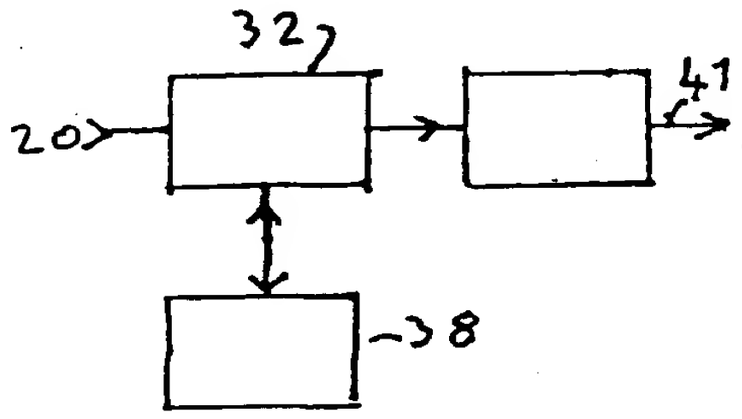
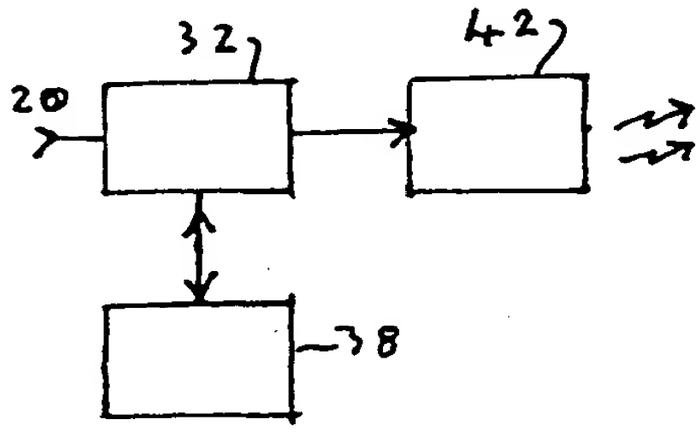


Fig. 2B



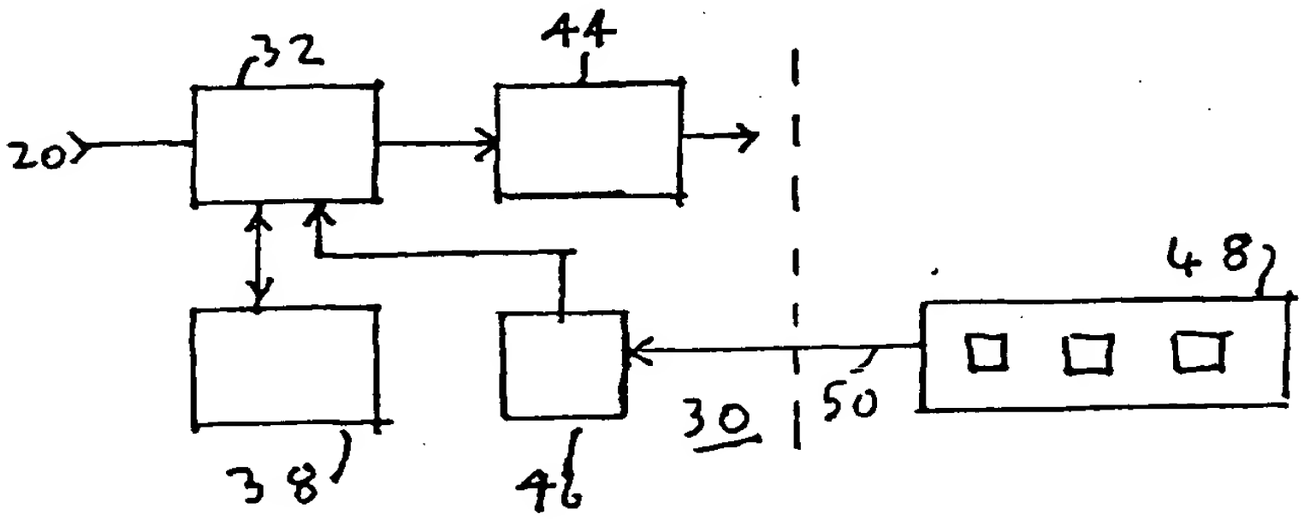


Fig. 2C